

IDENTIFICATION: DIGITAL RECORDER (DR-1) CONTROL SUBROUTINE

PURPOSE: To provide on-line control of the DR-1 Digital Recorder pen and drum.

STORAGE: The subroutine is relocatable and occupies one long line with the exception of sectors 231-234, 354-357 and 373-376.

TIMING: Output proceeds at approximately 200 steps per second for a continuous graph. When plotting points spaced at 1/2 inch, output proceeds at approximately 75 points per minute.

USE:

1. Calling Sequence

The calling sequence for the subroutine is as follows:

LDA number of increments of 1/100 inch in
 the X direction, negative numbers in
 two's complement form, Q = 21

LDB number of increments of 1/100 inch in
 the Y direction, negative numbers in
 two's complement form, Q = 21

LDC return (see paragraph 2)

TRU entry

Entry is 000LL, where LL is the line location of the subroutine.

2. Return Command

The return command determines the mode of plotting as follows:

a. A sequence-tagged TCN command to lower the pen, plot to the point (X_0 , Y_0) and exit to the main program.

USE (cont.):

- b. A sequence-tagged TAN command to lower the pen, plot to the point (X_0, Y_0) , mark the point, and exit to the main program.
- c. A sequence-tagged TBN command to raise the pen, and, upon reaching the point (X_0, Y_0) , exit to the main program.
- d. A TRU command to raise the pen and, upon reaching the point (X_0, Y_0) , lower the pen, mark the point and exit to the main program.
- e. A sequence-tagged TOF command to set the pen location counter to $(0, 0)$ and exit to the main program.

3. Exit

Upon returning to the main program, the contents of the A and B registers contain X_0 and Y_0 respectively.

METHOD:

A PTU command with line number of 30 is used to enable the plotter. The WOC commands controlling the movement of the pen and drum are as follows:

SSS WOC 10	to raise the pen
SSS WOC 00	to lower the pen
SSS WOC 21	to step + X
SSS WOC 31	to step - X
SSS WOC 24	to step + Y
SSS WOC 26	to step - Y
SSS WOC 20	to step + X + Y
SSS WOC 30	to step - X + Y
SSS WOC 22	to step + X - Y
SSS WOC 32	to step - X - Y

A PTU with line number 32 is used to disable the plotter.

The subroutine determines the number of steps required to move the pen from its present location to the location supplied by the main program as follows:

$$X_0 - X_1 = X_2$$

$$Y_0 - Y_1 = Y_2$$

The movement of the pen and drum is divided into three stages, enabling the approximate line to be plotted as close as possible to the desired line.

DR-1 DIGITAL RECORDER SUBROUTINE

100010.

00000⁷₂,

Y_0	X_0	Y_1	X_1	$\pm X_2$	CONST	BRANCH	CREATED FLAG	U			
001	002	011	012	052	072	077	107	161	231	232	233
234	236	240	243	252	334	336	343	350	354	355	356
357	361	363	365	373	374	375	376				

W00010.

00000⁷_{2D}

000	001S1307;	STD	+0062634
003	004S1007;	STC	+0222034
004	[000S3504;	TAN]	+0027220 EXIT
005	006S0200;	IBC	+0320400
006	036S7030;	PTU	+1736140
007	021S2110;	SLT	+1064240
010	011S1307;	STD	+0462634
013	004S3707;	TRU	+0227634
014	252 0000;	HLT	2500000
015	117S1107;	STA	+4762234
016	000 00001	HLT	+0000001
017	363 1107;	STA	-7142234
020	235S3707;	TRU	-1667634
021	171 3607;	TBN	+7447434
022	027S2110;	SLT	+1364240
023	250 0507;	LDA	-2401234
024	153 1507;	SUB	+6543234
025	075 3507;	TAN	+3647234
026	024S3707;	TRU	+1227634
027	033 3607;	TBN	+1547434
030	031S0507;	LDA	+1461234
031	224S6000;	WOC	-1234000
032	036S1107;	STA	+1722234
033	034S0507;	LDA	+1621234
034	224S6010;	WOC	-1234040
035	036S1107;	STA	+1722234
036	[224S6000;	WOC]	-1234000
037	005S4400;	CLC	+0271000
040	046 0507;	LDA	+2301234

041	065 3507;	TAN	+3247234	
042	246S7032;	PTU	-2336150	
043	045S2110;	SLT	+2264240	
044	053S4500;	CLA	+2571200	
045	046S1207;	STB	+2322434	
046	[220 0000;	HLT	-1000000]	MARK FLAG
047	001 0707;	LDP	+0041634	
050	012 1507;	SUB	+0503234	
051	052S1107;	STA	+2522234	
053	054S0300;	ROT	+2620600	
054	060 1507;	SUB	+3003234	
055	061S4300;	CLB	+3070600	
056	011 1507;	SUB	+0443234	
057	060S1107;	STA	+3022234	
060	[377S7763;	FES	-7777716]	± Y ₂
061	044 3507;	TAN	+2207234	
062	064 3407;	TCN	+3207034	
063	070S0100;	IAC	+3420200	
064	065S0100;	IAC	+3260200	
065	066S4400;	CLC	+3331000	
066	067S4500;	CLA	+3371200	
067	023S6000;	WOC	+1174000	
070	052 1507;	SUB	+2503234	
071	072S5607;	CAM	+3533434	
073	145 7507;	TOF	+6257234	
074	075S0100;	IAC	+3660200	
075	175S0407;	LDC	+7661034	
076	077S5607;	CAM	+3773434	
100	140 7507;	TOF	+6017234	
101	102S1107;	STA	+4122234	
102	[000 0031;	HLT	+0000144]	[X]
103	104S1007;	STC	+4222034	
104	[000 0031;	HLT	+0000144]	[X]
105	104 1507;	SUB	+4203234	
106	107S1107;	STA	+4362234	
110	113 3507;	TAN	+4547234	
111	102 0507;	LDA	+4101234	
112	113S0100;	IAC	+4560200	
113	102 0507;	LDA	+4101234	
114	115S4300;	CLB	+4670600	
115	[000 00001	HLT	+0000001]	P
116	117S0300;	ROT	+4760600	
117	[125S6026;	WOC]	+5274130	1 woc

120	244S1207;	STB	-2222434
121	122S1207;	STB	+5122434
122	[000 0031;	HLT	+0000144] <i>LARGE COORDINATE</i>
123	236 1007;	STC	-1702034
124	126S2110;	SLT	+5324240
125	127S1407;	ADD	+5363034
126	155S3100;	DIV	+6666200
127	000 00001	HLT	+0000001
130	115 5607;	CAM	+4653434
131	133 7507;	TOF	+5557234
132	116S4400;	CLC	+4731000
133	334 0507;	LDA	-5601234
134	135S1507;	SUB	+5663234
135	000 00001	HLT	+0000001
136	334 1107;	STA	-5602234
137	150S0300;	ROT	+6420600
140	334 1007;	STC	-5602034
141	142S0607;	LDB	+6121434
142	000 00001	HLT	+0000001
143	115 1207;	STB	+4642434
144	312S3707;	TRU	-4527634
145	334 1007;	STC	-5602034
146	147S0607;	LDB	+6361434
147	000 00001	HLT	+0000001
150	115 1207;	STB	+4642434
151	261S3707;	TRU	-3067634
152	153S1407;	ADD	+6563034
153	000 00001	HLT	+0000001
154	162S4400;	CLC	+7131000
155	115 1207;	STB	+4642434
156	122 0507;	LDA	+5101234
157	236 1507;	SUB	-1703234
160	161S1107;	STA	+7062234
162	163S4400;	CLC	+7171000
163	164S0000;	MAC	+7220000
164	165S0100;	IAC	+7260200
165	166S4100;	GTB	+7330200
166	167S0200;	IBC	+7360400
167	172S0200;	IBC	+7520400
170	172S2110;	SLT	+7524240
171	367S4500;	CLA	-7371200
172	221S3100;	DIV	-1066200
173	235 3507;	TAN	-1647234

174	362S3707;	TRU	-7127634
175	000 00041	HLT	+0000021
176	177S0607;	LDB	+7761434
177	022 4420;	CLC	+1111100
200	207 0507;	LDA	-0341234
201	210S2507;	IAM	-0425234
202	212S6024;	WOC	-0534120
203	212S6022;	WOC	-0534110
204	212S6032;	WOC	-0534150
205	212S6030;	WOC	-0534140
206	212S6020;	WOC	-0534100
207	212S6026;	WOC	-0534130
210	215 1107;	STA	-0642234
211	212S0100;	IAC	-0520200
212	213S0100;	IAC	-0560200
213	214S4400;	CLC	-0631000
214	216S2100;	LSD	-0724200
215	[212S6024;	WOC]	-0534120
216	200 3607;	TBN	-0007434
217	042 3407;	TCN	+2107034
220	212S0100;	IAC	-0520200
221	334 1207;	STB	-5602434
222	115 0407;	LDC	+4641034
223	253S3200;	MUP	-2566400
224	225S0507;	LDA	-1261234
225	000 00031	HLT	+0000015
226	016 1507;	SUB	+0703234
227	043 3507;	TAN	+2147234
230	226S3707;	TRU	-1327634
235	236S0507;	LDA	-1721234
237	240S5607;	CAM	-2033434
241	333 7507;	TOF	-5557234
242	243S4400;	CLC	-2171000
244	[251S6022;	WOC]	-2474110
245	361S0607;	LDB	-7061434
246	001 0707;	LDP	+0041634
247	010S3707;	TRU	+0427634
250	000 0007;	HLT	+0000034
251	331S1507;	SUB	-5463234
253	252 1207;	STB	-2502434
254	161 0507;	LDA	+7041234
255	252 1507;	SUB	-2503234
256	363 1107;	STA	-7142234

257	107 0507;	LDA	+4341234
260	312 3507;	TAN	-4507234
261	060 0507;	LDA	+3001234
262	266 3507;	TAN	-3307234
263	264S0507;	LDA	-3221234
264	377S6024;	WOC	-7774120
265	267S4400;	CLC	-3371000
266	267S0507;	LDA	-3361234
267	377S6026;	WOC	-7774130
270	271S5607;	CAM	-3473434
271	377S6024;	WOC	-7774120
272	052 0607;	LDB	+2501434
273	303 7507;	TOF	-4157234
274	300 3607;	TBN	-4007434
275	276S0607;	LDB	-3721434
276	251S6022;	WOC	-2474110
277	357S4400;	CLC	-6771000
300	301S0607;	LDB	-4061434
301	251S6032;	WOC	-2474150
302	357S4400;	CLC	-6771000
303	307 3607;	TBN	-4347434
304	305S0607;	LDB	-4261434
305	251S6020;	WOC	-2474100
306	357S4400;	CLC	-6771000
307	310S0607;	LDB	-4421434
310	251S6030;	WOC	-2474140
311	357S4400;	CLC	-6771000
312	052 0507;	LDA	+2501234
313	317 3507;	TAN	-4747234
314	315S0507;	LDA	-4661234
315	377S6021;	WOC	-7774104
316	320S4400;	CLC	-5031000
317	320S0507;	LDA	-5021234
320	377S6031;	WOC	-7774144
321	322S5607;	CAM	-5133434
322	377S6021;	WOC	-7774104
323	060 0607;	LDB	+3001434
324	327 7507;	TOF	-5357234
325	300 3607;	TBN	-4007434
326	310S0607;	LDB	-4421434
327	275 3607;	TBN	-3647434

330	305S0607;	LDB	-4261434	
331	000 00001	HLT	+0000001	
332	236 1107;	STA	-1702234	
333	334S0507;	LDA	-5621234	
335	336S5607;	CAM	-5733434	
337	341 7507;	TOF	-6057234	
340	352S4400;	CLC	-6531000	
341	363 0507;	LDA	-7141234	
342	343S5607;	CAM	-6173434	
344	346 7507;	TOF	-6317234	
345	361S4500;	CLA	-7071200	
346	236 0507;	LDA	-1701234	
347	350S5607;	CAM	-6433434	
351	040 7507;	TOF	+2017234	
352	234S4500;	CLA	-1631200	
353	116S4500;	CLA	+4731200	
360	371S1107;	STA	-7462234	
362	363S0507;	LDA	-7161234	
364	365S5607;	CAM	-7273434	
366	235 7507;	TOF	-1657234	
367	370S4400;	CLC	-7431000	
370	007S4300;	CLB	+0370600	
371	[377S6026;	WOC	-7774130] T WOC
372	014S1507;	SUB	+0623234	
377	016S1507;	SUB	+0723234	

W